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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/677,720	10/02/2003	Benjamin B. Kimia	BRU02-01	9208

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EXAMINER	
BROOME, SAID A	
ART UNIT	**PAPER NUMBER**
2671	

DATE MAILED: 12/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/677,720	KIMIA ET AL.	
	Examiner	Art Unit	
	Said Broome	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 October 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *15-23* is/are allowed.

6)☒ Claim(s) *1 and 7-9* is/are rejected.

7)☒ Claim(s) *2-6 and 10-14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 2-6 and 10-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The prior art, Leymarie et al. "The Shock Scaffold for Representing 3D Shape." and Tek et al. "Shocks From Images: Propagation of Orientation Elements", do not teach all the limitations of claim 2. Leymarie et al. illustrates a defined plurality of clusters within a plurality of points in Figures 5 and 7, as described in claim 2. However, none of the cited prior art teaches examining each cluster of points to determine pairs of generators based on visibility constraints between pints, generating a shock candidate from each of said pairs of generators, for each shock candidate forming a contact sphere, and examining said contact sphere to find whether said contact sphere is contained within a cluster with the shock candidate, when said contact sphere is contained with a cluster with said shock candidate, then validating each shock candidate by examining said contact sphere and its generators within said cluster where said shock candidate is validated as a shock if no generating points other than its generators are included in said contact sphere, where a plurality of shocks are created from validated shock candidates, each shock holding topology information about the multidimensional shape derived from said generators, as recited in claim 2.

Regarding claim 10, Leymarie et al. teaches a defined multi-dimensional grid in space around a plurality of points in Figure 5. However, none of the cited prior art teaches or suggests

defining a fixed multi-dimensional grid in space around said plurality of points with the multi-dimensional grid including a plurality of chambers, initiating cellular automata along said grid in a subset of possible directions from a first chamber including a first point of said plurality of points and from a second chamber including a second point of said plurality of points, propagating said cellular automata through said grid outward from said first and said second chambers until each said cellular automaton collides with another cellular automaton and determining a shock at each collision, as recited in claim 10.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Allowable Subject Matter

Claims 15-23 are allowed. The following is an examiner's statement of reasons for allowance:

The prior art, Leymarie et al. "The Shock Scaffold for Representing 3D Shape." and Tek et al. "Shocks From Images: Propagation of Orientation Elements", do not teach all the limitations of claim 15. Leymarie et al. illustrates receiving a plurality of points in space as input in Figure 6. However, none of the prior art teaches determining pair s of generator polygons based on visibility constraints between polygons in said plurality, generating a first plurality of wavefronts from a first generator in each pair, generating a second plurality of wavefronts from a second generator polygon in each pair, where said pluralities of wavefronts include planar

wavefronts from planes of said first and said second generator polygons, spherical wavefronts from said vertices of said first and said second generator polygons, and cylindrical wavefronts from edges of said first and said second generator polygons, determining shocks form collisions of first plurality of wavefronts and said second plurality of wavefronts and generating a shock scaffold representing said multidimensional shape from said plurality of shocks where the multidimensional shape can be reconstructed from the shock scaffold, as recited in claim 15.

Regarding claim 16, Tek et al. teaches shocks containing topology information about a multidimensional shape on page 840 second column 3rd paragraph section (*iii*). However, none of the cited prior art teaches storing position information from a plurality of generator points related to the surface of the multidimensional shape and flow direction of the surface of the multidimensional shape, a plurality of implicit curve segments connecting said plurality of shocks, a plurality of implicit shock sheets described by said plurality of implicit curve segments wherein said plurality of shocks, said plurality of implicit curve segments, and said implicit shock sheets form a directed graph that is a representation of the multidimensional shape where the multidimensional shape can be reconstructed form the information contained in the shock scaffold, as recited in claim 16.

Regarding claim 20, Leymarie illustrates receiving a plurality of points in space as input in Figure 6, it is therefore apparent that there is a system containing an interface configured to receive a plurality of sample point corresponding to the multidimensional shape. Leymarie et al. illustrates generating a shock scaffold to represent a multidimensional shape based on a plurality of sample points in Figures 7 and 8, as described in step (i) of claim 20. However, none of the cited prior art teaches a memory, a controller coupled to said memory and said interface, said

controller being configured to store said shock scaffold in said memory, wherein said shock scaffold includes nodes defined as critical points of flow speed and direction of surface boundaries of said multidimensional shape.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leymarie et al. ("The Shock Scaffold for Representing 3D Shape.") in view of Tek et al.("Shocks From Images: Propagation of Orientation Elements").

Regarding claim 1, Leymarie teaches all the limitations except forming shocks from wavefronts, the plurality of shocks containing topology information that includes speed, acceleration and direction from boundaries of the multidimensional shape. Leymarie et al. illustrates receiving a plurality of points in space as input in Figure 6. Leymarie et al. teaches generating a shock scaffold from a plurality of shocks on page 1 first paragraph lines 8-10.

Leymare et al. also teaches a shock scaffold representing the multidimensional shape where the multidimensional shape is capable of being reconstructed form the shock scaffold, as described on page 2 third paragraph lines 1-3 and on page 9 third paragraph lines 1-3. Again, Leymarie fails to teach forming shocks from wavefronts, the plurality of shocks containing topology information that includes speed, acceleration and direction from boundaries of the multidimensional shape. Tek et al. teaches forming shocks by initiating wavefronts where shocks are formed at collisions of wavefronts, as described on page 839 first column 1st paragraph lines 13-14 and is illustrated in Figure 8(c). Tek et al. also teaches shocks containing topology information about a multidimensional shape on page 840 second column 3rd paragraph section (*iii*). Tek et al. teaches the topology information including flow speed and accelerations and direction from boundaries of the multidimensional shape on page 840 second column 3rd paragraph section (*iii*), where it is described that the velocity and directional boundary properties are included. It would have been obvious to one of ordinary skill in the art to combine the teachings of Leymarie et al. with Tek et al. because this combination would provide generated shock graphs for organizing shape information, such as topology information, in a multidimensional form.

Regarding claim 7, Leymarie et al. teaches the generation shock curves from shocks on page 2 paragraph 3 lines 7-8. Leymarie et al. also teaches the generation of a set of shock vertices of a shock scaffold from shock curves on page 4 Figure 3B where it is illustrated that the shock vertices A_1A_3 are generated from curves A_1 and A_3.

Regarding claim 8, Leymarie et al. teaches receiving connectivity information from points in a Voronoi diagram on page 2 paragraph 1 lines 1-3 where it is described that medial

axis symmetries can be obtained, therefore connectivity information would be obtainable as well. Leymarie et al. also explains that Voronoi diagrams are used to represent and form the model of 3D medial axis symmetries, or shock graphs, as described on page 2 paragraph 1 lines 1-3.

Regarding claims 9, Leymarie teaches representing a Voronoi diagram of a three dimensional medial axis, therefore a Voronoi diagram, which is known in the art, would be obtainable from a shock scaffold as well because a shock scaffold is a representation of a medial axis containing points, as described on page 2 paragraph 3 lines 3-4.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Said Broome whose telephone number is (571)272-2931. The examiner can normally be reached on 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Broome
11/29/2005 SB

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